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Appeal
Brief
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of: CARNIER ET AL.	)	
Serial No. 09/499,060	)	Examiner: T. Cunningham
Confirmation No. 9699	)	Art Unit: 2816
Filing Date: February 4, 2000	)	
For: VOLTAGE RAMP GENERATOR AND CURRENT RAMP GENERATOR INCLUDING SUCH A GENERATOR	)	

APPELLANTS' APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner For Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith is Appellants' Appeal Brief together with the requisite $320.00 large entity fee for filing a brief. If any additional fee is required, authorization is given to charge Deposit Account No. 01-0484.

(1) Real Party in Interest

The real party in interest is STMicroelectronics S.A., a French corporation.

(2) Related Appeals and Interferences

At present there are no related appeals or interferences.

(3) Status of the Claims

The rejection of Claims 9-37 and 40 is being appealed. These claims are listed in the attached Appendix

(9). Claims 38 and 39 have been cancelled.

(4) Status of Amendments

All amendments have been entered and there are no further pending amendments.

(5) Summary of the Invention

The present invention is directed to an integrated circuit voltage ramp generator produced using semiconductor technology. The integrated circuit voltage ramp generator comprises a capacitance **C** and a charging circuit **Ig2, T4, T5, Re** connected to the capacitance, as best shown in FIG. 3 from the original specification and reproduced below for convenience, and as described on pages 5-9 of the application.

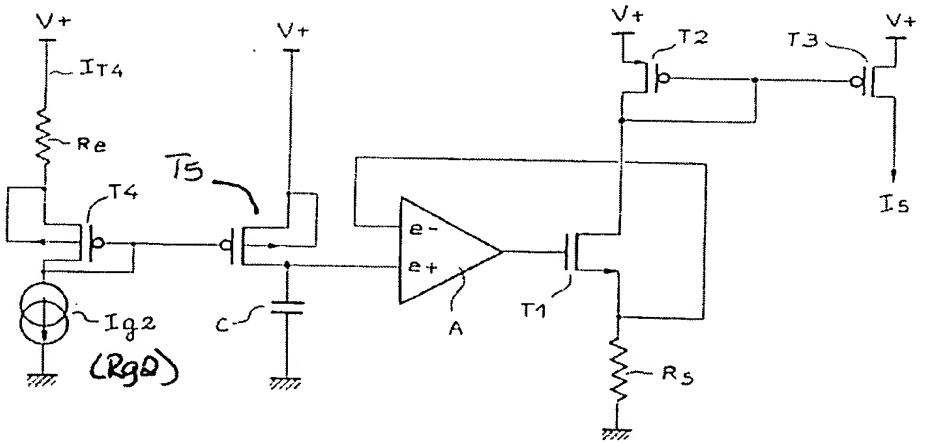

FIG. 3 from the Appellants' specification

The charging circuit comprises a current generator **Ig2** having a first resistance **Rg2**, and a circuit **T4, T5** connected to the current generator and to the capacitance **C**. The circuit **T4, T5** also has a second resistance **Re** which enables a capacitance charging current to be proportional to a square of a ratio of the second resistance **Re** and the first resistance **Rg2**. In addition, the first and second resistances **Rg2** and **Re** are of a same type technology.

Since the first and second resistances **Rg2, Re** are of the same type technology (CMOS technology or bipolar technology, for example), their respective spreads can be more easily compensated. This spread may be due to operating temperature changes, for example. As discussed on page 7, lines 11-24 of the Appellants' specification, the second resistance **Re** may be chosen with a temperature variation coefficient of the same order of magnitude as that for the first resistance **Rg2**, for example. This advantageously allows compensation for variations in temperature due to the first resistance **Rg2**.

Without the second resistance **Re**, the spread of the first resistance **Rg2** may be reflected in variations of the capacitance charging current. To compensate for the spread of the first resistance **Rg2**, the second resistance **Re** is included. The capacitance charging current is thus controlled based upon the ratio of the second and first resistances **Re** and **Rg2**. In particular, the capacitance charging current is proportional to a square of a ratio of the second resistance **Re** and the first resistance **Rg2**.

(6) Issues

The issues presented on appeal are whether Claims 9-37 and 40 are indefinite under 35 U.S.C. §112 based upon the recitation "said first and second resistances having a same technology type"; and whether Claims 9-37 and 40 are unpatentable under 35 U.S.C. §103 over the Appellants' prior art FIG. 1 in view of the Tanigawa patent (U.S. Patent No. 4,814,724) and in view of the Lauffenburger patent (U.S. Patent No. 5,254,957).

(7) Grouping of Claims

Claims 9-37 and 40 stand or fall together.

(8) Arguments

I. The Claims

Independent Claim 9, for example, is directed to an integrated circuit voltage ramp generator produced using semiconductor technology. The integrated circuit voltage ramp generator comprises a capacitance, and a charging circuit connected to the capacitance. The charging circuit comprises a current generator having a first resistance, and a circuit connected to the current generator and to the capacitance. The circuit has a second resistance and enables a capacitance charging current to be proportional to a square of a ratio of the second resistance and the first resistance. The first and second resistances have a same type technology.

Independent Claim 15 is similar to independent Claim 9 except the claim recites that the circuit connected to the current generator is a "degenerate circuit."

Independent Claim 21 is directed to an integrated circuit current ramp generator produced using semiconductor technology. The integrated circuit current ramp generator comprises a voltage ramp generator as recited in independent Claim 9, and a conversion circuit connected to the voltage ramp generator for generating a current ramp.

Independent Claim 29 is similar to independent Claim 21 except the claim recites that the circuit connected to the current generator is a "degenerate circuit," and that the conversion circuit is a third resistance.

Independent Claim 36 is a method for generating a ramp voltage, and is similar to independent device Claim 9.

II. The Claims Are Definite

The Examiner rejected independent Claims 9-37 and 40 as being indefinite under 35 U.S.C. §112 based upon the recitation "said first and second resistances having a same technology type." As correctly noted by the Examiner, support in the specification may be found on page 7, lines 13-15, which provides that the "resistances **Re** and **Rg2** are chosen to be of the same type of technology, thereby allowing compensation for their spreads." However, the Examiner has taken the position that this recitation is not clearly understood "based on the broad and vague disclosure therefore in the specification."

The Appellants submit that the same technology type is more clearly defined on page 4, lines 26-31 of the specification, which provides:

> "According to the preferred embodiment of the invention, the components forming the voltage ramp generator and the current ramp generator are produced using CMOS technology. The invention also relates to where the components are produced using a different technology, such as bipolar technology, for example. (Emphasis added.)

The specification thus discloses that the components of the voltage ramp generator and the current ramp generator are produced using CMOS technology, or alternatively, bipolar technology. The first and second resistances **Re**, **Rg2** are two such components making up these generators, and two example technology types are CMOS technology and bipolar technology. Therefore, the appellants submit that the claim recitation "said first and second resistances having a same technology type" is fully supported by the specification.

III. The Claims Are Patentable

The Examiner rejected independent Claims 9, 15, 21, 29 and 36 over the Appellants' prior art FIG. 1 in view of the Tanigawa patent and in view of the Lauffenburger patent.

The Appellants' prior art FIG. 1 discloses a ramp generator having a current source **Ig1** with no expressed teaching of the structure thereof, as illustrated in FIG. 1 of the Appellants' specification which is reproduced below. The Examiner cited Tanigawa as disclosing in FIG. 4 a current sink comprising "a current mirror" which has the advantage of gain control, which is also reproduced below.

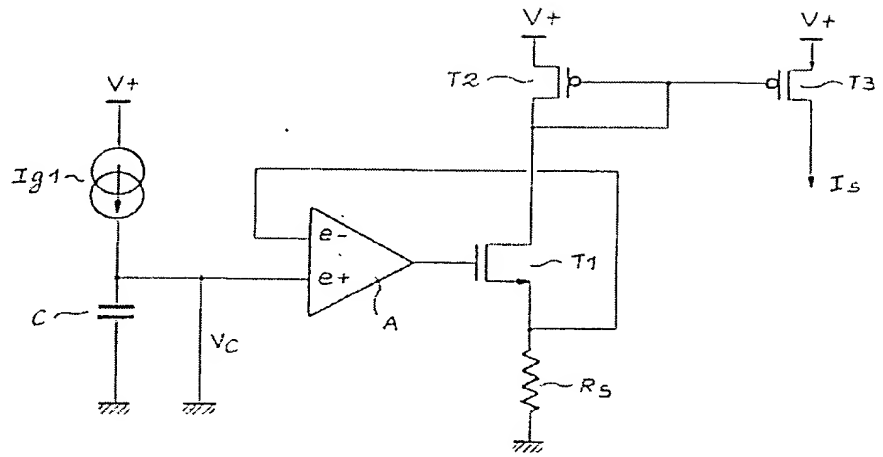

FIG. 1 of Appellants' specification

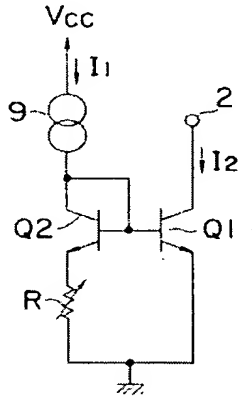

FIG. 4 of Tanigawa

The Examiner has taken the position that it would have been obvious to modify the current sink as disclosed in Tanigawa to a current source, and replace the current source

Ig1 in the Appellants' prior art FIG. 1 with the modified current source for obtaining a constant current with gain control. Moreover, the Examiner has further taken the position that since this modification yields a circuit identical in structure to the claimed invention, "it must inherently have the same function." The Appellants respectfully disagree based upon the following analysis.

In the Tanigawa patent, a gain control circuit of the current mirror type is disclosed in FIG. 4. The relationship between the signal current I_1 and the output current I_2 is based upon the equation $I_2 = I_1 * A$. The Examiner previously characterized the output current I_2 as the capacitance charging current in the present invention. The variable **A** is based upon the equation $\exp(V_{BE}/V_T)$, with V_T being a thermal voltage.

Referring to column 1, lines 59-61 in Tanigawa, which provides:

> "Therefore, the output current I_2 is set equal to a value A times larger than the input current I_1 ..." (Emphasis added.)

Tanigawa thus fails to teach or suggest that the capacitance charging current is proportional to a square of a ratio of the second resistance and the first resistance, as recited in independent Claim 9, for example.

The Examiner previously took the position that this argument only deals with the steady-state operation of the gain control device illustrated in FIG. 4 of Tanigawa. The Examiner further stated that this had nothing to do with the

charging current that will exist when FIG. 4 is combined with the Appellants' prior art FIG. 1. However, in the discussion of FIG. 1 provided in the Background Section of the Appellants' specification, there is no reference that the capacitance charging current should be proportional to a square of a ratio of two different resistances, as recited in independent Claim 9.

Independent Claim 9 also recites that the integrated circuit voltage ramp generator is produced using semiconductor technology, and that the first and second resistances are of the same type technology. Since the first and second resistances are of the same type technology, their respective spreads can be more readily compensated.

In semiconductor integrated circuits, components typically have broad spreads. With respect to the current ramp generator illustrated in the Appellants' prior art FIG. 1, the spreads of resistors **Rg1** and **Rs** induce large variations of the gradient **ΔIs/Δt**, as discussed on page 3, lines 5-14 in the Appellants' specification. As discussed in the background section of the Appellants' specification, current ramp spreads are adjusted by adjusting the resistance **Rs** with memory points of the fuse type, as discussed on page 3, lines 15-24. This is a tedious and time consuming operation.

The second resistance in the claimed invention advantageously permits compensation for the variations of the first resistance. The gain control circuit illustrated in FIG. 4 of Tanigawa is a "conventional gain control circuit of the current mirror type." (column 1, lines 12-13). This gain control device is not suitable for semiconductor circuit

integration. Reference is directed to column 1, line 65 through column 2, line 2 in Tanigawa, which provides:

> "However, since the variable resistor **R** is necessary to be connected to the emitter of the transistor **Q2** externally in the circuit shown in FIG. 4, an external leading terminal is required. Accordingly, the circuit of FIG. 4, as it is, is not suitable for semiconductor circuit integration." (Emphasis added.)

In other words, the resistance **R** in Tanigawa is not of the same type technology as the resistance **Rg1** in the Appellants' prior art FIG. 1. This is in sharp contrast to the claimed invention which recites that the voltage ramp generator is produced using semiconductor technology, and that the first and second resistances have the same type technology. The Examiner cited Lauffenburger as disclosing circuitry being integrated onto a single substrate. The Appellants respectfully submit that Lauffenburger fails to provide the deficiencies as noted above, particularly with respect to the capacitance charging current being proportional to a square of a ratio of the second resistance and the first resistance. In fact, Lauffenburger fails to even mention resistors or resistances with respect to generating a capacitance charging current.

Therefore, even if the references were combined as suggested by the Examiner, the claimed invention is still not produced. In fact, Tanigawa teaches away from the claimed invention since the circuit illustrated in FIG. 4 is not suitable for semiconductor circuit integration.

It thus appears that the Examiner is using impermissible hindsight reconstruction to modify the Appellants' prior art FIG. 1 in view of in view of Tanigawa and Lauffenburger in an attempt to produce the claimed invention. The prior art references, individually or in combination, do not teach or suggest that 1) the integrated circuit voltage ramp generator is produced using semiconductor technology, with the first and second resistances having the same type of technology, and that 2) the capacitance charging current is proportional to a square of a ratio of the second resistance and the first resistance.

Accordingly, it is submitted that independent Claim 9 is patentable over the Appellants' prior art FIG. 1 in view of Tanigawa and Lauffenburger. Independent Claims 15, 21, 29 and 36 are similar to independent Claim 9. In view of the patentability of the independent claims as discussed above, it is submitted that their dependent claims, which recite yet further distinguishing features, are also patentable over the prior art. Thus, these dependent claims require no further discussion herein.

IV. Conclusion

In view of the foregoing arguments, it is submitted that all of the claims are patentable over the prior art. Accordingly, the Board of Patent Appeals and Interferences is respectfully requested to reverse the earlier unfavorable decision of the Examiner.

In re Patent Application of:
GARNIER ET AL.
Serial No. **09/499,060**
Filing Date: **February 4, 2000**
_____/

Respectfully submitted,

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: MS APPEAL BRIEF - PATENTS, COMMISSIONER FOR PATENTS, P.O. BOX 1450, ALEXANDRIA, VA 22313-1450, on this 20 day of May, 2003.

Kristen Dranetke

(9) Appendix

The claims in the appeal are Claims 9-37 and 40 as follows.

9. An integrated circuit voltage ramp generator produced using semiconductor technology and comprising:

a capacitance; and

a charging circuit connected to said capacitance and comprising

a current generator having a first resistance, and

a circuit connected to said current generator and to said capacitance, said circuit having a second resistance and enabling a capacitance charging current to be proportional to a square of a ratio of the second resistance and the first resistance, said first and second resistances having a same type technology.

10. A voltage ramp generator according to Claim 9, wherein said charging circuit comprises a degenerate current mirror circuit.

11. A voltage ramp generator according to Claim 10, wherein said degenerate current mirror circuit comprises:

a first MOS transistor having a channel of a first conductivity type comprising a gate, a drain and a source, the drain and the gate being connected to said current generator, and the source being connected to said second resistance; and

a second MOS transistor having a channel of the first conductivity type comprising a gate, a drain and a source, the gate being connected to the gate of said first MOS transistor, the source being connected to a supply voltage, and the drain being connected to said capacitance.

12. A voltage ramp generator according to Claim 11, wherein each of said first and second MOS transistors comprises a P-channel MOS transistor.

13. A voltage ramp generator according to Claim 9, wherein said capacitance comprises a gate capacitance of a MOS transistor.

14. A voltage ramp generator according to Claim 9, wherein current generated by said current generator is based upon the equation:

$$Ig2 = K2 \times \frac{Vg2}{Rg2}$$

where Ig2 is the current, K2 is a proportionality coefficient, Rg2 is the first resistance, and Vg2 is a reference voltage proportional to the quantity $k\frac{T}{q}$, where k is the Boltzmann constant, T is absolute temperature, and q is the charge of an electron.

15. An integrated circuit voltage ramp generator produced using semiconductor technology and comprising:

a capacitance; and

a charging circuit connected to said capacitance and comprising

a current generator having a first resistance, and

a degenerate current mirror circuit connected to said current generator and to said capacitance, said degenerate current mirror circuit having a second resistance for generating a capacitance charging current that is proportional to a square of a ratio of the second resistance and the first resistance, said first and second resistances having a same type technology.

16. A voltage ramp generator according to Claim 15, wherein said current generator has a first resistance, and said degenerate current mirror circuit has a second resistance such that the capacitance charging current is proportional to a square of a ratio of the second resistance and the first resistance.

17. A voltage ramp generator according to Claim 15, wherein said degenerate current mirror circuit comprises:

a first MOS transistor having a channel of a first conductivity type comprising a gate, a drain and a source, the drain and the gate being connected to said current generator, and the source being connected to said second resistance; and

a second MOS transistor having a channel of the first conductivity type comprising a gate, a drain and a

source, the gate being connected to the gate of said first MOS transistor, the source being connected to a supply voltage, and the drain being connected to said capacitance.

18. A voltage ramp generator according to Claim 17, wherein each of said first and second MOS transistors comprises a P-channel MOS transistor.

19. A voltage ramp generator according to Claim 15, wherein said capacitance comprises a gate capacitance of a MOS transistor.

20. A voltage ramp generator according to Claim 15, wherein current generated by said current generator is based upon the equation:

$$Ig2 = K2 \times \frac{Vg2}{Rg2}$$

where Ig2 is the current, K2 is a proportionality coefficient, Rg2 is the first resistance, and Vg2 is a reference voltage proportional to the quantity $k\frac{T}{q}$, where k is the Boltzmann constant, T is absolute temperature, and q is the charge of an electron.

21. An integrated circuit current ramp generator produced using semiconductor technology and comprising:

a voltage ramp generator comprising

a capacitance, and

a charging circuit connected to said capacitance and comprising

a current generator having a first resistance, and

a circuit connected to said current generator and to said capacitance, said circuit having a second resistance and enabling a capacitance charging current to be proportional to a square of a ratio of the second resistance and the first resistance, said first and second resistances having a same type technology; and

a conversion circuit connected to said voltage ramp generator for generating a current ramp.

22. A current ramp generator according to Claim 21, wherein said conversion circuit comprises a third resistance.

23. A current ramp generator according to Claim 21, wherein said third resistance comprises an implanted resistance having a positive temperature coefficient.

24. An integrated circuit current ramp generator according to Claim 21, wherein said charging circuit comprises a degenerate current mirror circuit.

25. A current ramp generator according to Claim 24, wherein said degenerate current mirror circuit comprises:

a first MOS transistor having a channel of a first conductivity type comprising a gate, a drain and a source, the

drain and the gate being connected to said current generator, and the source being connected to said second resistance; and

a second MOS transistor having a channel of the first conductivity type comprising a gate, a drain and a source, the gate being connected to the gate of said first MOS transistor, the source being connected to a supply voltage, and the drain being connected to said capacitance.

26. A current ramp generator according to Claim 25, wherein each of said first and second MOS transistors comprises a P-channel MOS transistor.

27. A current ramp generator according to Claim 21, wherein said capacitance comprises a gate capacitance of a MOS transistor.

28. A current ramp generator according to Claim 21, wherein current generated by said current generator is based upon the equation:

$$Ig2 = K2 \times \frac{Vg2}{Rg2}$$

where Ig2 is the current, K2 is a proportionality coefficient, Rg2 is the first resistance, and Vg2 is a reference voltage proportional to the quantity $k\frac{T}{q}$, where k is the Boltzmann constant, T is absolute temperature, and q is the charge of an electron.

29. An integrated circuit current ramp generator produced using semiconductor technology and comprising:

a voltage ramp generator comprising

a capacitance having a first resistance, and

a charging circuit connected to said capacitance and comprising

a current generator, and

a degenerate current mirror circuit connected to said current generator and to said capacitance, said degenerate current mirror circuit having a second resistance for generating a capacitance charging current that is proportional to a square of a ratio of the second resistance and the first resistance, said first and second resistances having a same type technology; and

a third resistance connected to said voltage ramp generator for generating a current ramp.

30. A current ramp generator according to Claim 29, wherein said current generator has a first resistance, and said degenerate current mirror circuit has a second resistance such that the capacitance charging current is proportional to a square of a ratio of the second resistance and the first resistance.

31. A current ramp generator according to Claim 29, wherein said third resistance comprises an implanted resistance having a positive temperature coefficient.

32. A current ramp generator according to Claim 29, wherein said degenerate current mirror circuit comprises:

a first MOS transistor having a channel of a first conductivity type comprising a gate, a drain and a source, the drain and the gate being connected to said current generator, and the source being connected to said second resistance; and

a second MOS transistor having a channel of the first conductivity type comprising a gate, a drain and a source, the gate being connected to the gate of said first MOS transistor, the source being connected to a supply voltage, and the drain being connected to said capacitance.

33. A current ramp generator according to Claim 32, wherein each of said first and second MOS transistors comprises a P-channel MOS transistor.

34. A current ramp generator according to Claim 29, wherein said capacitance comprises a gate capacitance of a MOS transistor.

35. A current ramp generator according to Claim 29, wherein current generated by said current generator is based upon the equation:

$$Ig2 = K2 \times \frac{Vg2}{Rg2}$$

where Ig2 is the current, K2 is a proportionality coefficient, Rg2 is the first resistance, and Vg2 is a

reference voltage proportional to the quantity $k\frac{T}{q}$, where k is the Boltzmann constant, T is absolute temperature, and q is the charge of an electron.

36. A method for generating a ramp voltage comprising:

generating a capacitance charging current using an integrated circuit charging circuit produced using semiconductor technology and comprising a current generator having a first resistance and a circuit connected to the generator, the circuit having a second resistance and enabling the capacitance charging current to be proportional to a square of a ratio of the second resistance and the first resistance, said first and second resistances having a same type technology; and

charging a capacitance with the capacitance charging current for generating the ramp voltage.

37. A method according to Claim 36, wherein the circuit comprises a degenerate current mirror circuit.

40. A method according to Claim 36, wherein current generated by the current generator is based upon the equation:

$$Ig2 = K2 \times \frac{Vg2}{Rg2}$$

where Ig2 is the current, K2 is a proportionality coefficient, Rg2 is the first resistance, and Vg2 is a

reference voltage proportional to the quantity $k\frac{T}{q}$, where k is the Boltzmann constant, T is absolute temperature, and q is the charge of an electron.